REMARKS

Claims 1 to 13 were pending when last examined. Applicant has amended claims 1, 3, 8, and 13, and added claim 14. Claims 1 to 14 remain pending.

§ 103 Rejections

Claims 1, 2, 4, and 13

The Examiner rejected claims 1, 2, 4, and 13 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,393,162 ("Higurashi ") in view of U.S. Patent Application Publication No. 2002/0191865 ("Yamaguchi et al.").

Addressing claim 1, the Examiner stated that Higurashi teaches all the elements of claim 1 except rotating the first portion of the first image, saving the rotated first portion of the first image in a nonvolatile memory, rotating a first stitched image of a second portion of the first image and a third portion of a second image, and saving the first stitched image in the nonvolatile memory. The Examiner then cited Yamaguchi et al. for disclosing dividing an original image into blocks, rotating each block to achieve a different orientation of the original image, and then saving the rotated blocks into appropriate places in memory. The Examiner found it would be obvious to combine Higurashi and Yamaguchi et al. in order to achieve a different orientation of an image and to ensure that all image portions are in the same orientation.

Applicant submits there is no motivation to modify Higurashi with Yamaguchi et al. in the manner of amended claim 1. Higurashi discloses a method for generating a panoramic image from a series of images. Yamaguchi et al. discloses a method for a copier to process an image in blocks before scanning the entire image in order to rotate the image, to flip the image, to combine the image with another image, or to generate another image by repeating all or part of the image. Neither Higurashi nor Yamaguchi et al. provides any motivation to rotate images that make up a panoramic image to achieve a different orientation for the panoramic image. Such a panoramic image would be difficult to view since it is not displayed along a camera motion direction of the images that make up the panoramic image. For example, images taken along a horizontal camera direction would be rotated and combined to form a panoramic image oriented along a vertical direction that is difficult to view.

Applicant notes that the invention of claim 1 was devised to efficiently use volatile memory to create a panoramic image. Specifically, the invention of claim 1 rotates portions of images that make up a panoramic image in order to sequentially save the panoramic image to nonvolatile memory along its smaller dimension (e.g., the height of the images) instead of its larger dimension (e.g., the sum of the width of the images). As the panoramic image is saved along its smaller dimension, a smaller amount of volatile memory is needed to buffer the panoramic image before it is saved to nonvolatile memory. In contrast, if the panoramic image is saved to nonvolatile memory along its longer dimension (e.g., the sum of the width of the images), a large amount of volatile memory would be necessary to buffer the entire panoramic image before it can be saved to nonvolatile memory. At the end of this process, the panoramic image is rotated back to the original orientation of the images so the panoramic image can be properly displayed along a camera motion direction of the images.

In view of above, Applicant has amended claim 1 to further clarify the claimed invention and t0 expedite prosecution. Amended claim 1 now recites:

1. A method for generating a panoramic image, comprising:

receiving a first image;

dividing the first image into a first portion and a second portion;

orthogonally rotating the first portion of the first image;

saving the rotated first portion of the first image as part of the panoramic image in a nonvolatile memory;

receiving a second image;

dividing the second image into a third portion and a fourth portion;

matching an overlapping region between the second portion of the first image and the third portion of the second image;

stitching the second portion of the first image and the third portion of the second image to form a first stitched image;

orthogonally rotating the first stitched image;

saving the first stitched image as part of the panoramic image in the nonvolatile memory; and

orthogonally rotating the panoramic image back to an original orientation of the first and the second images and saving the panoramic image in the nonvolatile memory.

Amended claim 1 (emphasis added).

One embodiment of the invention recited in amended claim 1 is explained in view of Fig. 2. A first image 1 is divided into a first portion 1A and a second portion 1B. First portion 1A is rotated and then saved as part of a panoramic image 8 in nonvolatile memory. A second image 2 is divided into a third portion 2A and a fourth portion 2B. Second portion 1B of first image 1 and third portion 2A of second image 2 are matched according to an overlap between them and then stitched to form a first and then second portion 1B and third portion 2B are stitched to form a first stitched image 4. First stitched image 4 is rotated and then saved as part of panoramic image 8 in nonvolatile memory. Panoramic image 8 is rotated back to the original orientation of first image 1 and second image 2 and then saved in nonvolatile memory.

Applicant submits that the combination of Higurashi and Yamaguchi et al. does not disclose "rotating the panoramic image back to an original orientation of the first and the second image and saving the panoramic image in the nonvolatile memory" as recited in amended claim 1. Higurashi is silent as to dividing images into portions, rotating a portion and a stitched image of two portions, saving the rotated portion and the stitched image as parts of a panoramic image, and rotating the panoramic image back to an original orientation of the images. While Yamaguchi et al. does disclose dividing an image into blocks, rotating the blocks, and saving the blocks in appropriate memory locations to form a new image, it does not disclose rotating the new image back to the original orientation of the blocks.

For all of the reasons above, amended claim 1 is patentable over Higurashi and Yamaguchi et al.

Claims 2, 4, and 13 depend from amended claim 1 and are patentable for at least the same reasons as amended claim 1.

Claims 3 and 5 to 7

The Examiner rejected claims 3 and 5 to 7 under 35 U.S.C. § 103(a) as being unpatentable over Higurashi in view of Yamaguchi et al. and further in view of U.S. Patent No. 6,157,747 ("Szeliski et al.").

Addressing claim 3, the Examiner found that Higurashi and Yamaguchi et al. do not disclose the recited equations for projecting first and second images onto a cylinder. The Examiner then cited

Szeliski et al. for disclosing a formula for a camera focal length and found it would be obvious for one skilled in the art to derive the recited equations from the camera focal length equation. Applicant respectfully traverses.

The derivation of the recited equations of claim 3 is explained in paragraphs [0027] to [0031] and illustrated in Fig. 4. Applicant cannot find a similar derivation in Szeliski et al. and Applicant submits that one skilled in the art would not be able to derive the recited equations from the camera focal length equation of Szeliski et al. If the Examiner continues with this rejection, Applicant respectfully requests the Examiner to explicit explain how the recited equations of claim 3 can be derived from the camera focal length equation of Szeliski et al. Please note that Applicant has amended claim 3 to independent form, including the limitations of original claim 1.

Claims 5 to 7 depend from amended claim 1 and are patentable for at least the same reasons as amended claim 1.

Claims 8 to 12

The Examiner rejected claims 8 to 12 under 35 U.S.C. § 103(a) as being unpatentable over Higurashi in view of Yamaguchi et al. and further in view of U.S. Patent No. 6,385,349 ("Teo").

Addressing claim 8, the Examiner found that Higurashi and Yamaguchi et al. do not disclose stitching portions of two images using a minimum color difference path. The Examiner then cited Teo for disclosing a feathering technique that computes weighted pixel values in an overlap region between two images to minimize color differences and one skilled in the art would have combined Teo with Higurashi and Yamaguchi et al. to minimize color differences. Applicant respectfully traverses.

The recited blending technique in claim 8 is different from the feathering technique disclosed in Teo. As explained in paragraph [0037] and illustrated in Fig. 6, the recited blending technique determines a minimum color difference path in an overlapping region between two images and then fills pixels on either size of the path with the appropriate colors. On the other hand, the feathering technique of Teo discloses using weighted pixel values to minimize color differences in an overlapping region between two images. The feathering technique of Teo simply does not determine a minimum color difference path in the overlapping region. Please note that Applicant has amended claim 8 to independent form, including the limitations of original claim 1.

Claims 9 to 12 depend from amended claim 8 and are patentable for at least the same reasons as amended claim 8.

New Claim

New claim 14 depends from amended claim 1 and is patentable for at least the same reasons as amended claim 1.

Summary

In summary, claims 1 to 13 were pending in the above-identified application when last examined. Applicant has amended claims 1, 3, 8, and 13, and added claim 14. For the above reasons, Applicant respectfully requests the Examiner to withdraw the claim rejections and allow claims 1 to 14. Should the Examiner have any questions, please call the undersigned at (408) 382-0480.

I hereby certify that this correspondence is being transmitted prior to expiration of the set period of time by being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4).

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Signature Date

Respectfully submitted,

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